In regard to the mortality in 1855, Dr. Trezevant says: "We have lost 31 patients: 15 of these, from their enfeebled state, would have died under any circumstances, but their death was hurried on by the improper accommodations of the house, and the unwholesome condition of the yard. The rest suffered from bowel complaint, then prevailing, and were the victims of our want of proper ventilation and arrangements. * * * In dry seasons the mortality is about five per cent., but in wet it has been equal to about one in three. In the present year the bowel affections commenced with the rainy season, continued whilst it lasted, and ceased when the earth was no longer saturated with moisture."

We have carefully perused the reports before us, and find therein but little which comes within the scope of our notices, while that little is upon subjects already fully laid before our readers. The chief burthen of the reports from this institution, for several years past, consists of an exposition of the imperfections of the Asylum, and the necessity of a new one. The building is old, and imperfect in its architectural construction and arrangements. Its grounds are too limited, and are immediately surrounded by dwelling-houses of citizens of Columbia. It appears that one or more of its wards are so damp as seriously to affect the health of the inmates. The whole is so much crowded that, as stated in one of the reports, there are fifty patients more than can be properly accommodated. The heating and ventilation are bad. There are no proper arrangements of baths and water-closets. In short, judging from the reports, the whole establishment stands but as a representative of the past. It is acknowledged as such by the Regents, the Physician, and the Superintendent. This has been granted for years. The question, therefore, has been, What shall be done? We have exposition after exposition of the defects. We have suggestions for erecting additional buildings to those which now exist. We have propositions to erect an entirely new establishment upon the lands now occupied. We have argument upon argument to prove that a new structure should be erected more remote from the town. And yet the question is—What shall be done? There is a liberal appropriation yet unexpended. Different models have been presented for the new edifice. One of these is preferred and highly extolled by one party, but rejected and condemned in the strongest terms by another. And still, alas! still the question is—What shall be done? And the relic of the past, with "all its imperfections on its head," continues unmolested, and its inmates rejoice in the comforts of antiquity, because the powers that be cannot agree upon a substitute.

Art. XV.—*Deux Mémoires sur la Physiologie de la Moelle Épinière, lus à l'Académie des Sciences,* le 27 Août et le 24 Septembre, 1855. Par le Docteur E. Brown-Séquard. Lauréat de l'Académie des Sciences, etc. etc. 8vo. pp. 42. Paris, 1855.

Recherches Expérimentales sur la transmission croisée des Impressions Sensitives dans la Moelle Épinière. Par le Docteur E. Brown-Séquard, etc. etc. 8vo. pp. 19. Paris, 1855.

Propriétés et Fonctions de la Moelle Épinière: Rapport sur quelques Experiences de M. Brown-Séquard. Lu à la Société de Biologie, le 21 Juillet, 1855. Par M. Paul Broca, Professeur Agrégé à la Faculté de Médecine, etc. 8vo. pp. 35. Paris, 1855.

Two Memoirs on the Physiology of the Spinal Cord, read to the Academy of Sciences, August 27 and September 24, 1855. By E. Brown-Séquard, M. D.

Experimental Researches into the Decussation which takes place in the Transmission of Sensitive Impressions through the Spinal Cord. By E. Brown-Séquard, M. D.

Properties and Functions of the Spinal Cord: A Report on some Experiments of M. Brown-Séquard. Read to the Biological Society, July 21, 1855. By M. Paul Broca.

The recent investigations of Dr. Brown-Séquard have thrown very important light on the physiology of the spinal cord, especially on the manner in which sensitive impressions received by the different portions of the body are transmitted, through it, to the brain.

While the fact is now, apparently, well established, that the posterior roots of the spinal nerves are the sole route for the transmission of sensitive impressions to the sensorium, there still continues to exist much diversity of opinion as to the portion of the spinal cord through which these impressions are conveyed to the brain. According to Backer, Kuerschner, and Longet, it is solely by the posterior fasciculi of the cord. Bellingeri refers the transmission to the central and Stilling to the posterior portion of the gray substance alone, while Ludwig Türck refers it to the lateral fasciculi. Eigenbrodt, while he describes the posterior fasciculi as the principal medium of transmission, believes that it may also take place through the gray substance, probably by the white fibres contained in this portion of the cord. According to Schiff, both the gray substance and the posterior fasciculi are the media of transmission, and one of these portions of the cord may supply the action of the other. Rolando and Calmeil suppose that every portion of the spinal cord is capable of transmitting sensitive impressions to the brain.

This diversity of opinion in reference to a subject that would appear, at first sight, so easy to determine by experiment, Dr. Brown-Séquard supposes to have arisen from ignorance on the part of the experimenters of one or other, or several of the following circumstances:—

1st. The existence of reflex movements.

2d. The decussation which occurs in the transmission through the spinal cord of sensitive impressions.

3d. The possibility of this transmission being made by parts devoid themselves of sensibility; and,

4th. The possibility of exposing the spinal cord, without causing an excessive loss of blood, and without exhausting the sensibility of the animal.

By a series of well devised and skilfully executed vivisections, Dr. Brown-Séquard has very clearly demonstrated that, it is not by the posterior fasciculi of the spinal cord that ultimately takes place the transmission to the brain of the sensitive impressions made upon the trunk and limbs, but by the gray substance of the cord, and especially by its central portion.

Dr. Brown-Séquard has endeavoured to show, by a number of ingenious and very striking experiments, carefully made by him upon the living animal, and varied so as to avoid, as much as possible, all sources of error, that the transmission of sensitive impressions through the spinal cord is made, in great part, if not entirely, in a decussative manner; that is to say, the impressions that come from the right side of the body are transmitted to the brain by the left half of the cord, and *vice versa.*

The general conclusions deduced from these experiments, and verified by numerous pathological facts, are as follow:—

1st. The decussation of the elements by which sensitive impressions are conveyed to the brain, does not take place, as it has been asserted, at the anterior extremity of the spinal protuberance.

2d. The gray substance of the cord does not possess the property, as some physiologists pretend, of transmitting sensitive impressions in every direction.

3d. The most part, if not all the elements by which sensitive impressions are transmitted, decussate in the spinal cord; that is to say, those coming from the right half of the body pass into the left half of the cord, and *vice versa.*

4th. The decussation of these elements occurs, in part, almost immediately after their entrance into the spinal cord; a few of them decussate at a certain distance above the place of entrance, while others, on the contrary, and much the greatest number, descend into the cord and decussate a certain distance below the point of entrance.

5th. If there be some of the elements by which sensitive impressions are transmitted that ascend from the limbs or trunks along the entire course of the spinal cord to make their decussation in the brain, their number must be very inconsiderable.

6th. The lesions capable of producing a paralysis of sensibility, seated at any point of a lateral half of the cerebro-spinal centre, produce always the paralysis of sensibility in the opposite side of the body. There is no difference, in this respect, between the brain and spinal cord, as has heretofore been supposed.

In a more recent memoir, Dr. Brown-Séquard describes a series of further vivisections, which, besides confirming the correctness of the general conclusions in reference to the functions of the spinal cord deduced by him from his former experiments, have conducted to results, in reference to the organization and physiology of that important organ, of a character at once novel and highly interesting.

In previous experiments, Dr. B. S. demonstrated that when the two posterior fasciculi of the cord are divided transversely, both the divided surfaces remain sensible. This fact would appear to prove, contrary to what physiologists have universally admitted, that the transmission of sensitive impressions may take place, in the posterior fasciculi of the cord, in two opposite directions. The following experiment performed by Dr. B. S., leads, on this question, to results much more positive:—

"In a dog, cat, or full grown rabbit, we divide transversely the two posterior fasiculi of the spinal cord, at the inferior portion of the dorsal region; we then dissect these fasciculi from the divided edges, longitudinally, for the distance of two or three centimètres, so as to separate from the surface of the cord that distance, two laminæ, continuous, the one by its superior, and the other by its inferior extremity, with the rest of the cord. The sensibility persists, but weakened, in both of the separated laminæ, and we have verified the fact a great number of times, since 1852 when we first announced it,.that the inferior lamina appears to be more sensitive than the superior."

Subsequently, Dr. B. S. has varied this experiment, by taking two animals of the same species, and in each separating a single lamina from the surface of the posterior fasciculi, leaving it continuous with the cord at its upper extremity in the one, and at its lower extremity in the other. In comparing the sensibility of the laminæ in the two animals, it was found, as in the preceding experiment, that the one which remained attached to the cord by its lower end, exhibited a greater degree of sensibility than the other.

If, remarks the Doctor, we dissect up laminæ comprising not only the posterior fasciculi, but also a part of the lateral fasciculi of the posterior gray cornua, we find the sensibility to be much more acute in the two laminæ than when they are composed only of the posterior fasciculi. The length of the flaps has also a considerable influence upon the degree of their sensibility. The shorter they are the greater their sensibility. When over four or five centimètres in length, they have scarce any sensibility near their free extremity.

It is evident that the impressions made upon the free extremity of a flap detached from the posterior fasciculi of the cord, excepting at its lower end, must be centrifugal, and as, in those fasciculi, the only nervous element we can detect for the transmission of sensations are fibres, it therefore results, according to Dr. B. S., that fibres, capable of transmitting sensitive impressions in a centrifugal direction, exist in the posterior fasciculi of the spinal chord. By the following experiments, he shows that these fibres merely pass in the posterior fasciculi, and after a short course pass out again and penetrate the gray matter.

We divide, transversely, the posterior fasciculi on a level with the tenth dorsal vertebra, and from the surface of these fasciculi, below the section, we separate a flap of about two or three centimètres in length, and leave it attached to the cord by its inferior extremity. Having assured ourselves that this flap retains its sensibility, we then divide transversely the two posterior fasciculi, at the distance of one centimètre below the spot where the flap is connected with the cord, and we find that the flap is deprived of all or nearly all its sensibility.

"If, in place of making the second section at only one, we make it at five or more centimètres below the spot at which the flap remains continuous with the cord, we find that the sensibility of the flap continues unimpaired. In this case, the fibres for centrifugal transmission have quitted the posterior fasciculi to pass into another portion of the cord, because the second incision did not reach them, as it did in the first case, where they were all or nearly all divided."

The fibres referred to it is evident, therefore, quit, after passing a short distance, the posterior fasciculi; whence go they? The following facts show that they pass into the central gray substance.

"If in three animals, after having separated a flap from the posterior fasciculi of the cord, adherent by its inferior extremity, we divide transversely, at about four or five centimètres anteriorly to the flap, in one of the animals, the lateral fasciculi, in a second, the anterior fasciculi, and in the third, the gray substance, we find that, in the last animal, the sensibility of the flap is destroyed, while it still continues in the other two. But if we divide in these the central gray substance, on a level with the spot at which the flap is continuous with the cord, the flap is deprived of its sensibility."

It is therefore in the central gray substance that pass the descending fibres of the posterior fasciculi, or those for centrifugal transmission. Analogous experiments show that in the flaps of the posterior fasciculi that adhere by their superior extremity, the ascending fibres, or those for centripetal transmission quit, also, very soon the posterior fasciculi to penetrate into the central gray substance of the cord.

"The foregoing experiments," remarks the Doctor, "would seem to authorize the following conclusions:—

"1st. That there are two species of sensitive fibres in the posterior fasciculi of the cord: the one ascending, or for centripetal transmission; the other descending, or for centrifugal transmission.

"2d. That in the posterior fasciculi, either the descending fibres are more numerous than the ascending, or they are capable, under certain circumstances, of inducing a greater amount of pain than the ascending fibres.

"3d. That the ascending as well as the descending fibres merely pass into the posterior fasciculi, and after running along them for a short distance, come out again to penetrate into the central gray matter of the cord."

Dr. B. S. has shown, by direct experiment, that a considerable number of the ascending and descending fibres are derived from the posterior spinal nerves; or, in other words, immediately upon their arrival in the cord, these nerves send fibres into the posterior fasciculi, of which a portion pass towards the brain, while another portion take an opposite direction. But all of these fibres quit soon the posterior fasciculi to penetrate into the central gray substance of the cord. The following experiment shows that they pass from the right posterior fasciculus to the left portion of the gray matter.

"In a rabbit we divide a lateral half of the cord, transversely, on a level with the first lumbar vertebra, and then cut longitudinally the cord to the extent of two centimètres in the direction of its antero-posterior plane, downwards from the transverse section, and at a right angle with it. A small portion of the cord is thus separated at every part excepting its inferior extremity. In another rabbit we in the same way separate a small portion of the cord at every part excepting its superior extremity. Thus, in the first rabbit the impression, when the posterior nerves that are inserted in the partially separated portion of the cord, will be transmitted by the descending and in the second by the ascending fibres. If it is on the right side of the cord that the incisions have been made, and we divide, on the left side, the posterior fasciculus, at the distance of five centimètres above the part at which the first incision has been made, in irritating the posterior nerves which are inserted in the partially separated portion of the cord, we find them to be still sensible, but if, at the part where the left posterior fasciculus is divided, we cut through, transversely, the left lateral half of the central gray substance, the nerves referred to lose their sensibility."

Experiments detailed by Dr. B. S., in which, after two transverse sections of the posterior fasciculi, made at a short distance from each other, sensibility has been diminished or lost in the posterior nervous roots included between the incisions, seem to prove that a considerable number of the fibres of these roots pass to the posterior fasciculi. Other experiments, in which, after two transverse sections of the posterior fasciculi, the posterior roots, included between the incisions, retain in a striking degree their sensibility, would seem to show that the fibres of the nervous roots which pass by the posterior fasciculi, come out again after running a certain course.

"The cut surfaces of the section of a segment of the posterior fasciculi, resulting from two transverse divisions of these fasciculi, appear," remarks Dr. B. S., "always to differ, the one from the other, in their degree of sensibility; the greatest amount appearing to exist in the uppermost.

"In the experiment performed by dividing transversely the posterior fasciculi in two places, very near to each other, we obtain a very curious result. We refer to the hyperæsthesia which exists everywhere below the inferior section. Of the three segments which result from a division, at two points, of the posterior fasciculi, the upper or cephalic has a normal sensibility, the middle, a very feeble sensibility, and the posterior or caudal, an exaggerated sensibility. This exalted sensibility of the lower segment is always observed, excepting when the division has been made near to the caudal extremity of the cord, and it is, I may add, the greater in direct proportion to the size of the segment.

"The state of sensibility in a segment of the posterior fasciculi, included between two transverse sections, has a direct relation with that of the nervous roots inserted in the segment, and of those portions of the body which derive their sensitive fibres from these roots. That is to say, when the sensibility of the fasciculi is diminished or augmented in a certain proportion, there is a corresponding diminution or augmentation in the nervous roots and all the parts of the body to which these send fibres.

"If, as we have attempted to show, the fibres of the posterior nervous roots pass, in part, into the posterior fasciculi, we should find, after having divided transversely the entire cord, excepting the posterior cords, that sensibility persists, to a certain extent, in the posterior fasciculi and nervous roots, behind the section; and such is actually the case, as we have shown in a preceding memoir. In this experiment, the posterior roots of the two or three pair of nerves that are immediately behind the point where the cord is divided, retain their sensibility through those of their fibres that pass by the posterior fasciculi. This is not the case, however, with the nervous roots situated at a greater distance behind the point of division; their sensibility is lost, because, such of their fibres as pass by the posterior fasciculi have already quitted the posterior fasciculi and penetrated into the gray substance beyond the point of division.

"The following experiment shows that the fibres of the posterior nervous roots which pass by the posterior fasciculi a short distance behind where the latter have been divided, again leave these fasciculi a short distance in front of the division.

"In a cat or dog, after a transverse section of all the cord, save the posterior fasciculi, on a level with the tenth dorsal vertebra, we assure ourselves that sensibility persists in the posterior fasciculi, for the extent of some centimètres behind the point of division, as well as in the posterior roots of the two or three pair of nerves that are immediately behind this point. Then, upon one animal, at the distance of one centimètre, and in another, at the distance of five or six centimètres, in front of the first described section, we divide transversely the posterior fasciculi; in the first animal we find that sensibility is destroyed, while, in the second, it continues behind the part at which the first described section had been made. If, however, we divide, in this latter, transversely, the central gray matter, at the point where the posterior fasciculi had been divided, we shall find that the sensibility is lost."

"It is probable," Dr. B. S., remarks, "that certain fibres of the posterior nervous roots pursue a similar course in the gray cornua with those which go to the posterior cords, that is to say, after penetrating into the cornua, the fibres separate into ascending and descending, and after a short course penetrate the central gray substance. It is at least what may be rationally concluded from the following experiments:—

"Before and behind the posterior roots of a pair of nerves, we thrust into the posterior gray cornua, in a direction perpendicular to the longitudinal axis of the cord, a flat needle with a double cutting-edge, so as to cut the cornua transversely. We find subsequently that the posterior nervous roots between the four punctures made in the cornua have lost a considerable portion of their sensibility."

"We divide, transversely, on a level with and anterior to the last pair of dorsal nerves, the greater portion of the fibres of the posterior fasciculi, saving, as much as possible, the surrounding gray substance. We afterwards perform the same operation behind the second pair of lumbar nerves; so as to comprehend three pair of nerves between the two divisions. The sensibility we find still persists sufficiently acute in the posterior nervous roots intermediate to the points of division. If now the two sections are enlarged laterally, so as to divide the remaining fibres of the posterior fasciculi as well as the posterior gray cornua, the sensibility is diminished in a manifest degree in the nervous roots referred to. If, in addition to the sections already made, we also divide a considerable portion of the lateral chords, we find that these roots lose, still more, their sensibility."

From these experiments, it would appear that the posterior gray cornua as well as the lateral fasciculi, at least their posterior portion, are the parts for the passage of a certain number of the fibres of the posterior nervous roots. In regard to the lateral fasciculi, this conclusion is rendered still more probable by the following experiment:—

"At two places, immediately before and behind the posterior roots of three pair of nerves, we divide, transversely, the posterior portion of the lateral fasciculi, taking care to avoid, as much as possible, the central gray substance and the posterior cornua, and we find that an evident, though not very considerable diminution, occurs in the sensibility of the posterior roots of the three pair of nerves included between the divisions. The diminution of sensibility is much more evident when the two, or rather four sections, are so performed as to include only a single pair of nerves between them."

The fibres of the posterior nervous roots that pass into the lateral fasciculi, as well as those which proceed to the gray cornua, are ascending or descending like those which go to the posterior fasciculi. Besides, the fibres of the nervous roots which pass a certain distance along the lateral fasciculi and the posterior cornua, quit soon these parts to penetrate into the central gray substance. These facts are demonstrated, in regard to the posterior cornua and lateral fasciculi, in the same manner as in reference to the posterior fasciculi.

It would appear, then, that in the spinal cord, the posterior spinal roots are arranged very similar to the ganglionar root of the trigeminus nerve, which, as we are aware, is divided in the spinal protuberance and bulb, into three portions, of which two, of little size, are the one ascending, and the other transverse, while the third, the bulbar root, is very large, and descending.

From the facts and reasoning Dr. B. S. has adduced, he believes that he is able to draw two series of conclusions, as follows:—

"I. *Conclusions relative to the distribution of the Fibres of the Posterior Nervous Roots in the Spinal Cord.*—1. The fibres of the posterior nervous roots appear to pass in part to the posterior fasciculi, and probably also, but in a very small number, to the lateral fasciculi.

"2. The fibres of the posterior roots which pass to the posterior fasciculi, appear to proceed, in part, towards the brain, and, in part, in the opposite direction; so the one portion are ascending, and the other descending.

"3. The fibres of the posterior roots which pass to the lateral fasciculi, seem also to be composed of two series, the one ascending the other desending.

"4. In the posterior gray cornua, there appears to be, also, ascending and descending fibres derived from the posterior roots.

"5. In the posterior and lateral fasciculi, as well as in the posterior gray cornua, the descending fibres appear to be more numerous than the ascending.

"6. The ascending and descending fibres derived from the posterior nervous roots appear, after passing for a short distance, to leave the posterior and lateral fasciculi, as well as the posterior gray cornua, to penetrate the central gray substance.

"II. *Conclusions relative to the transmission of Sensitive Impressions in the*

Spinal Cord.—1. On their arrival at the spinal cord the sensitive impressions pass by the posterior fasciculi, the posterior gray cornua, and probably, also, by the lateral fasciculi.

"2. In these different portions of the cord, the sensitive impressions mount or descend, and, after a short course, towards the brain or in the opposite direction, they quit these portions of the cord to enter the central gray subtance, in which, or by which they are finally transmitted to the brain."

The fifth conclusion of the first series is one which, according to Dr. B. S., is the least positively established of the six. In saying that descending fibres appear to be more numerous than the ascending, he wishes only to be understood as offering the probable explanation of the hyperæsthesia of those portions of the body which are behind the point at which the posterior fasciculi of the cord have been divided transversely. He is aware that there are two other explanations that may be given of this phenomenon which possess perhaps equal probability. Thus, it is possible that it is a property of the descending fibres to possess a greater amount of sensibility than the ascending, if so it is not necessary to explain the fact referred to by supposing that there should be more descending than ascending fibres. It is very certain that there is a special cause of the hyperæsthesia experienced, after a division of the posterior fasciculi, in the parts below that division, and consequently the descending fibres should cause more pain than the ascending in the experiments of Dr. B. S., because the properties of the descending fibres cannot be tested until after the posterior fasciculi, or one of them have been divided.

"It is possible, then, that even though inferior in number, the descending fibres may cause a greater amount of pain than the ascending. Let the question be settled as it may in reference to the relative number of the different fibres, an important anatomical and physiological fact results from the facts reported in this memoir, it is that the posterior nervous roots of the cord, in the same manner as the great root of the trigeminus in the bulb, send into the cord sensitive descending fibres, or those for centrifugal transmission. Anatomy must decide as to the *number*—with respect to the question of the *existence* of these fibres, anatomy has already confirmed what vivisections so positively teach. We have seen, and the most skilful microscopists have likewise seen descending fibres proceeding from the posterior nervous roots."

D. F. C.

ART. XVI.—*Clinical Lectures on Surgery.* By M. NÉLATON. *From Notes taken by* WALTER F. ATLEE, M. D. Philadelphia: J. B. Lippincott & Co., 1855. 8vo. pp. 755.

THIS volume, according to the preface, "contains the publication of notes taken, during a period of three years, 1851–52–53–54, from the remarks made upon cases to which attention was particularly directed. The course adopted in their arrangement has been, as a general rule, to class under the same head those in which the same pathological lesion existed, though in some few instances, when the great interest of the case lies in the diagnosis, this plan has been departed from, and the case has been classed with others, from the fact that it was *not* one of them."

The preface further informs us that the additions of the editor "are so placed as to be at once distinguished. This has been done very rarely, in fact almost solely, in order to make the work as respects surgical pathology more complete, by stating the results of microscopical investigations. These results have been taken from the works of M. Charles Robin, and of M. Lebert."

The title of the work, although not altogether in accordance with the statements of the preface and the actual contents, must insure for it an amount of attention, which we are glad to say there is much to gratify in the notes of which it is composed. Clinical lectures are always interesting; and the name of Nélaton as the lecturer is at present so attractive, that almost any report of his hospital teachings would be eagerly sought after by a numerous crowd of admirers in this country. We remember him ten years ago in the very same